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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/606,924	06/26/2003	Pieter van Rooyen	RONI-012/01US (186980-202	3857

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EXAMINER	
AHN, SAM K	
ART UNIT	**PAPER NUMBER**
2611	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	02/09/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No.	Applicant(s)	
	10/606,924	ROOYEN ET AL.	
	Examiner	Art Unit	
	Sam K. Ahn	2611	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *20 December 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-18* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *18* is/are allowed.

6)☒ Claim(s) *1-17* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *26 June 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

1. Applicant's arguments, see page 7, filed 12/20/06, with respect to the rejection(s) of claim(s) 1-17 under 103 have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of Papadias et al. US 2003/0174782 A1 (Papadias) in view of Seshadri et al. USP 6,584,593 B1 (Seshadri, cited previously). The office action at page 4, as pointed out by the applicant, the new rejection is as follows (emphasis added). The teaching of Seshadri in the system of Papadias by implementing the outer coding with turbo trellis coded modulation scheme in each of the encoder/mapper of Papadias (135-1 ~135-4), hence produces a turbo multiple trellis coded modulation scheme for the purpose of achieving coding gain (note col.1, line 54 – col.2, line 61). Complete explanation of the rejection is as below.

   On page 7, applicants assert that the rejection in the office action was an error because the combination of Papadias in view of Seshadri do not teach turbo multiple trellis coded modulation scheme. The examiner disagrees.

   The exact term of "Turbo multiple trellis coded modulation" is not well-known to one skilled in the art nor is it a term commonly used in the art. The specification and the drawing describes and illustrates (note figure 8) wherein Trellis coded modulations 804 and 806 form the MTCM or the multiple trellis coded modulation. Hence, having multiple of the trellis coded modulations form the "Turbo multiple trellis coded modulation".

Papadias teaches a method for transmitting a signal from a plurality of antennas (see 105-1 105-4 in Fig.2A) comprising: encoding by an outer encoder or channel encoding means (130,135-1 ~135-4 Encoder) configured to encode a stream of data (115) according to a turbo coded modulation scheme (turbo coding, note paragraph 0026), thereby generating a plurality of channel-coded symbol streams (137-1 ~ 137-4); an inner core or space-time encoding means (140) configured to receive the plurality of channel-coded symbol streams (137-1 ~ 137-4) and provide space-time coding to the plurality of channel-coded symbol streams (note paragraph 0028), thereby generating a plurality of space-time-channel-coded symbol streams (142-1 ~ 142-4); and a plurality of antennas (105-1 ~ 105-4) coupled to the inner encoder (140), wherein each of the plurality of antennas is configured to transmit one of the plurality of space-time-channel-coded symbol streams (wherein each of the plurality of antennas transmit its respective space-time-channel-coded symbol streams 142-1 ~142-4).

And although Papadias teaches implementing the turbo coded modulation scheme (135-1 ~ 135-4) using Turbo coding and further suggests that channel coding by Turbo codes, trellis codes are well-known in the art (note paragraph 0003), Papadias does not explicitly teach wherein turbo coded modulation scheme is a turbo multiple trellis coded modulation scheme.

Seshadri teaches, in the same field of endeavor, space-time encoding means (32 in Fig.1) receiving output signals from a turbo trellis coded modulation scheme (turbo TCM, note col.2, line 36) and transmitting the output of the space-time

encoding means by a plurality of antennas (33,34 in Fig.1). Hence, both Papadias and Seshadri teach turbo coding coupled to space time encoding and transmitting the output of the space time encoding by plurality of antennas wherein Seshadri further teaches implementing the turbo coding by the turbo coded modulation scheme, as explained above. Seshadri teaches that through the implementation of outer coding or Turbo trellis coded modulation scheme and inner coding or space time encoding, coding gain is achieved, which was not possible in prior art (note col.1, line 54 – col.2, line 61). Therefore, it would have been obvious to one skilled in the art at the time of the invention to incorporate the teaching of Seshadri in the system of Papadias by implementing the outer coding with turbo trellis coded modulation scheme in each of the encoder/mapper of Papadias (135-1 ~135-4), hence produces a turbo multiple trellis coded modulation scheme for the purpose of achieving coding gain (note col.1, line 54 – col.2, line 61).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 1-6, 9-11 and 13-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Papadias et al. US 2003/0174782 A1 (Papadias) in view of Seshadri et al. USP 6,584,593 B1 (Seshadri, cited previously).

Regarding claim 1, Papadias teaches a method for transmitting a signal from a plurality of antennas (see 105-1 105-4 in Fig.2A) comprising: encoding by an outer encoder or channel encoding means (130,135-1 ~135-4 Encoder) configured to encode a stream of data (115) according to a turbo coded modulation scheme (turbo coding, note paragraph 0026), thereby generating a plurality of channel-coded symbol streams (137-1 ~ 137-4); an inner core or space-time encoding means (140) configured to receive the plurality of channel-coded symbol streams (137-1 ~ 137-4) and provide space-time coding to the plurality of channel-coded symbol streams (note paragraph 0028), thereby generating a plurality of space-time-channel-coded symbol streams (142-1 ~ 142-4); and a plurality of antennas (105-1 ~ 105-4) coupled to the inner encoder (140), wherein each of the plurality of antennas is configured to transmit one of the plurality of space-time-channel-coded symbol streams (wherein each of the plurality of antennas transmit its respective space-time-channel-coded symbol streams 142-1 ~142-4).

And although Papadias teaches implementing the turbo coded modulation scheme (135-1 ~ 135-4) using Turbo coding and further suggests that channel coding by Turbo codes, trellis codes are well-known in the art (note paragraph

0003), Papadias does not explicitly teach wherein turbo coded modulation scheme is a turbo multiple trellis coded modulation scheme.

Seshadri teaches, in the same field of endeavor, space-time encoding means (32 in Fig.1) receiving output signals from a turbo trellis coded modulation scheme (turbo TCM, note col.2, line 36) and transmitting the output of the space-time encoding means by a plurality of antennas (33,34 in Fig.1). Hence, both Papadias and Seshadri teach turbo coding coupled to space time encoding and transmitting the output of the space time encoding by plurality of antennas wherein Seshadri further teaches implementing the turbo coding by the turbo coded modulation scheme, as explained above. Seshadri teaches that through the implementation of outer coding or Turbo trellis coded modulation scheme and inner coding or space time encoding, coding gain is achieved, which was not possible in prior art (note col.1, line 54 – col.2, line 61). Therefore, it would have been obvious to one skilled in the art at the time of the invention to incorporate the teaching of Seshadri in the system of Papadias by implementing the outer coding with turbo trellis coded modulation scheme in each of the encoder/mapper of Papadias (135-1 ~135-4), hence produces a turbo multiple trellis coded modulation scheme for the purpose of achieving coding gain (note col.1, line 54 – col.2, line 61).

Regarding claim 2, Seshadri further teaches wherein the space-time encoding includes block space-time coding (space-time or time-space coding comprising blocks of symbols, note col,4, lines 7-10 and 32-33).

Regarding claim 3, Seshadri further teaches wherein the space-time encoding includes convolutional space-time coding (the MAP space-time encoder employing convolutional code, note col.5, lines 36-38).

Regarding claim 4, Seshadri further teaches wherein the encoding the streams of data includes maximizing a coding gain (coding gain, note col.1, line 60 - col.2, line 3) and the space-time encoding includes maximizing diversity gain (maximum possible diversity order for antennas, note col.1, lines 54-57).

Regarding claim 5, Papadias further teaches communication protocols QPSK (employing QPSK signal constellation in Fig.3A, note paragraph 0032).

Regarding claim 6, the claim is rejected as applied to claim 1 with similar scope.

Regarding claim 9, the claim is rejected as applied to claim 2 with similar scope.

Regarding claim 10, the claim is rejected as applied to claim 3 with similar scope.

Regarding claim 11, the claim is rejected as applied to claim 4 with similar scope.

Regarding claim 13, the claim is rejected as applied to claim 1 with similar scope.

Regarding claim 14, the claim is rejected as applied to claim 2 with similar scope.

Regarding claim 15, the claim is rejected as applied to claim 3 with similar scope.

Regarding claim 16, Papadias in view of Seshadri teach all of the limitation of a transmitter or the steps of encoding, space-time encoding, and transmitting as applied to claim 1. Papadias further discloses a receiving portion comprising: at least one antenna (201 in Fig.7) for receiving a plurality of transmitted space-time-channel-coded symbol streams, thereby generating a plurality of received space-time-channel-coded symbol streams (204-1 ~ 204-4); space-time decoder (206,207, note paragraph 0058) coupled to the at least one antenna (201), wherein the space-time decoder is configured to decode the plurality of received space-time-channel-coded symbol streams, thereby generating at least one channel-coded symbol stream (f1 ~ f4); and a channel decoder (211-1 ~ 211-4) configured to decode the at least one channel coded symbol stream (f1 ~ f4), thereby generating a stream of received data (215).

The recitation in the preamble is not given patentable weight since the recitation recites the intended use of a structure and the body of claim does not depend on the preamble for completeness and the bodily limitations are able to stand alone.

Regarding claim 17, the claim is rejected as applied to claim 16 with similar scope. The further limitation that the receiver and the transmitter is housed together is well-known in the art wherein Papadias teaches a wireless communication system, which is well-known in the art to have a two-way communication of transmitting and receiving. Therefore, it would have been obvious to one skilled in the art at the time of the invention to house together the transmitter and the receiver of Papadias for the purpose of providing a two-way communication.

3. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Papadias et al. US 2003/0174782 A1 (Papadias) in view of Seshadri et al. USP 6,584,593 B1 (Seshadri, cited previously) and Ling et al. US 2003/0043928 A1 (Ling, cited previously).

Regarding claim 7, Papadias in view of Seshadri teaches all subject matter claimed, as applied to claim 1. Papadias further teaches the outer encoder (130,135-1 ~ 135-4) includes a plurality of parallel coding chains (having parallel paths for coding), wherein each of the coding chains includes a trellis coded modulation encoder (trellis codes, note paragraph 0003) and QPSK mapper unit

(mapped by mapper 135-1 ~ 135-4, note paragraph 0026, in a QPSK symbol constellation or mapping in Fig.3A, note paragraph 0032). However, Papadias in view of Seshadri do not explicitly teach each of the coding chains further include a block symbol interleaver.

Ling also teaches wireless communication between two units (see Fig.1) and further teaches an outer coder includes a plurality of parallel coding chains (Encoder 712a ~ 712k in Fig.7) and each of the coding chains include an encoder, symbol mapping and a block symbol interleaver or channel interleaver. Hence, both Papadias and Ling teach outer coder including encoder (114 in Fig.1) and symbol mapping (118) wherein Ling further teaches interleaving (116) in order to provide temporal and frequency diversity against deleterious path effects such as fading (note paragraph 0084). Therefore, it would have been obvious to one skilled in the art at the time of the invention to incorporate the teaching of an interleaver in each of the outer coder of Papadias (130,135-1 ~ 135-4) for the purpose of providing temporal and frequency diversity against deleterious path effects such as fading, as taught by Ling (note paragraph 0084).

4. Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Papadias et al. US 2003/0174782 A1 (Papadias) in view of Seshadri et al. USP 6,584,593 B1 (Seshadri, cited previously) and Kapoor et al. USP 6,795,424 B1 (Kapoor, cited previously).

Regarding claim 8, Papadias in view of Seshadri teaches all subject matter claimed, as applied to claim 6. Although Papadias and Seshadri teach plurality of antennas, do not explicitly teach wherein the plurality of antennas are arranged so that the fading correlation between the antennas is below 0.5. Kapoor teaches plurality of antennas (see 52 in Fig.5) wherein the plurality of antennas are arranged so that the fading correlation between the antennas is below 0.5 (note col.12, line 65 – col.13 line 4). Therefore, it would have been obvious to one skilled in the art at the time of the invention to arrange the plurality of antennas having fading correlation below 0.5 for the purpose of having almost perfect correlation, as taught by Kapoor.

5. Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Papadias et al. US 2003/0174782 A1 (Papadias) in view of Seshadri et al. USP 6,584,593 B1 (Seshadri, cited previously) and Scalise et al. USP 6,785,861 B2 (Scalise, cited previously).

Regarding claim 12, Papadias in view of Seshadri teach all subject matter claimed, as applied to claim 6. Although S Papadias in view of eshadri teach an outer encoder and inner encoder, as previously explained, do not teach and interleaver interposed between the outer encoder and the inner encoder. Scalise teaches an interleaver (8 in Fig.3) receiving encoded data stream from an outer encoder (6) wherein it is further passed on to an inner encoder (8).

Therefore, it would have been obvious to one skilled in the art at the time of the invention to modify Seshadri's system to interpose the interleaver between the outer encoder and inner encoder, and having an inner decoder in the receiver, as taught by Scalise, for the purpose of improving communication between transmitter and receiver by detecting the errors (note col.6, lines 4-8).

Allowable Subject Matter

6. Claim 18 is allowed.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Sam Ahn whose telephone number is (571) 272-3044. The examiner can normally be reached on Monday-Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mohammad Ghayour can be reached on (571) 272-3021. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Sam K. Ahn
Patent Examiner

2/2/07